Superfund Program
Proposed Plan

U.S. Environmental Protection
Agency, Region II

Zschiegner Refining Company Site

August 2004

Dates to remember:
MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
August 20 - September 18, 2004
U.S. EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING:
August 25, 2004
U.S. EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Howell Middle School, 1 Kuzminski Way, Howell, New Jersey from 7:00 to 9:00 p.m. in the cafetorium.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center
Region II
290 Broadway, 18th Floor.
New York, New York
10007-1866
(212)-637-3261
Hours: Monday-Friday,
9 am to 5 pm

Howell Township Library
Old Tavern Road
P.O. Box 640
Howell, New Jersey 07731
(732) 938-2300
Hours:
Monday - 10 a.m. to 9 p.m.
Tuesday - 9 a.m. to 9 p.m.
Wednesday - 10 a.m. to 9 p.m.
Thursday - 9 a.m. to 9 p.m.
Friday - 9 a.m. to 5 p.m.
Saturday - 9 a.m. to 5 p.m. (or

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for cleaning up contaminated soil, sediment, and ground water at the Zschiegner Refining Company (ZRC) Site and provides the rationale for this preference. In addition, this Plan includes summaries of other cleanup alternatives evaluated for use at this site. This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency. EPA, in consultation with NJDEP, will select a final remedy for the site after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with NJDEP, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), and Section 300.430(f) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation and Feasibility Study (RI/FS) reports and other documents contained in the Administrative Record file for this site. EPA and NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the site.

SITE HISTORY

The ZRC site is a 6.1-acre former metals refining facility located in a rural residential area of Howell Township, Monmouth County, New Jersey (Figure 1). The Haystack Brook and its associated wetlands run north-south on the eastern portion of the property and a small pond is on adjacent property immediately southeast of the site. Maxim-Southard Road and the Candlewood residential development are located west of the property. A single-story building is located on the site about 140 feet east of Maxim-Southard Road. Two homes border the site; the closest house is within 50 yards of the on-site building. A public drinking water well serving approximately 48,000 people is located 6.5 miles from the site; private wells serve the property and its three closest neighbors.

The Zschiegner Refining Company operated from 1964 to 1992 as a precious metals recovery facility. Operations included the chemical stripping of precious metals from watch bands, photographic film, and electrical components. In October 1992, the U.S. Drug Enforcement Agency raided the facility based on suspicions of illegal drug manufacturing. At the time of the raid, approximately 3,000 different chemicals including peroxides, cyanides, caustics, and acids were found improperly stored at the facility.

On November 2, 1992, a removal action was initiated by EPA. Materials were segregated and transferred to acceptable containers, potentially explosive/reactive items were detonated, hazardous materials were removed off-site for disposal, liquids in vats and drums were sampled, and on-site soil and sediment samples were taken. Approximately 2,000 gallons of acidic solutions, 1,600 gallons of basic solutions, and 1,400 small containers of hazardous substances were gathered. Phase II of the removal action was initiated in March 1993 and involved the disposal of hazardous waste secured during Phase I. Further sampling was conducted in 1995; analysis of these samples revealed the presence of inorganic contaminants in the on-site soil and downstream surface water and sediment.

A Hazard Ranking System (HRS) report was prepared for the site in December 1997, and the site was placed on the National Priorities List (NPL) in March 1998.

SITE CHARACTERISTICS

In September 1998, an RI/FS was initiated at the ZRC site to determine the nature and extent of contamination. Physically, the site slopes downwards towards the wetland and Haystack Brook. A silty fine sand and gravel layer of between 13 and 29 feet in thickness underlies the topsoil at the site. Beneath this there exists a silt-clay confining layer that is an average of 30 feet thick. This layer separates the shallow ground water aquifer from the deep one. Shallow ground water flow is southeast from the ZRC property towards the wetland and brook. The shallow ground water discharges directly into the wetland and brook. Flow in the deep aquifer is also towards the brook.

Samples were collected from surface soil, subsurface soil, wetland sediment, ground water, wetland seeps, surface water sediment from Haystack Brook and the pond, and building material. Prior to the selection of soil and ground water sampling locations, a screening program was conducted.

In general, samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals. Metals are the primary contaminants at the site. They exceed applicable Federal, state, and site-specific cleanup criteria much more frequently and at far greater magnitudes than any organic compound. Therefore, the nature and extent of most contamination at the ZRC site can be accurately represented by focusing on just the nature and extent of metals, in particular, chromium, copper, and nickel. A summary of the findings for each media sampled is presented below. These findings include detected concentrations of chromium, copper, and nickel in each media. In order to better understand these concentrations, they may be compared to the preliminary remediation goals for the site, which are presented later in this plan.

Surface Soil Contamination

Surface soil has been impacted by the ZRC site. Overall, the contamination is characterized by chromium and copper, which exceed site-specific ecological risk-based standards, and nickel, which exceeds impact to ground water criteria. The average concentrations of chromium, copper, and nickel detected in surface soil were, respectively, 74, 89, and 25 parts per million (ppm), while the maximum detected concentrations of these constituents were 700, 950, and 140 ppm.

Three distinct areas of surface soil contamination exist at the site. The first, northern area, extends directly north from below the west half of the building and is best characterized by chromium contamination. The second area, extending northeast and east from below the east half of the building, is best characterized by nickel. The third area is relatively small and is characterized by chromium and nickel.

The northern and northeastern areas of surface soil contamination were probably contaminated through the direct discharge of waste to the ground surface. The third area of contamination probably resulted from the migration of waste and contamination downhill from the site building. Contaminants in surface soil represent a continuing source of contamination to areas of lower elevation, such as the wetlands, through surface water runoff. The contaminated surface soil also represents a continuing source of contamination to subsurface soil through leaching and infiltration.

Subsurface Contamination

Subsurface soil has been impacted by the ZRC site. Overall, the contamination is characterized by chromium, copper, and nickel that exceed site-specific impact to ground water screening criteria. Chromium, copper, and nickel were detected most often and at the highest magnitudes of all contaminants. Nine other metals were also detected at concentrations that exceed background levels. Maximum detected concentrations of chromium, copper, and nickel in subsurface soil were 68, 310, and

150 ppm, respectively.

Overall, shallow subsurface soil (down to four feet) closely mimics surface soil contamination, indicating that most subsurface soil contamination is the result of contaminant leaching and infiltration. Below four feet, the more distinct areas of contamination begin to coalesce and become more widespread.

Acids were used extensively during the operations at the site. Therefore, the soil and ground water have a relatively low (acidic) pH, which increases the solubility of metals. This helps explain the infiltration of metals into subsurface soils, and also indicates that subsurface soil is likely an ongoing source of ground water contamination.

Wetland Sediment

The wetland has been impacted by the ZRC site. Almost the entire wetland sediment study area is contaminated with chromium, copper, and nickel at concentrations that exceed New Jersey's sediment screening guidelines, as well as the site-specific health-based and ecological risk-based standards. Chromium, copper, and nickel were detected most often and at the highest magnitudes of all contaminants. Seven other metals, PAHs, pesticides, and PCBs were also detected at concentrations that exceed NJDEP Freshwater Sediment Screening Guidelines. However, these additional contaminants are found only sporadically and at relatively low levels.

Wetland sediment is known to be contaminated to a depth of 18 inches and this interval contains widespread contamination at concentrations that exceed cleanup criteria. The maximum detected concentrations of chromium, copper, and nickel were, respectively, 13,000, 8,200, and 4,100 ppm; average concentrations of these contaminants were 2,300, 1,700, and 310 ppm.

The most contaminated parts of the wetland are linked to areas of contaminated surface soil that, through overland transport and erosion, continue to act as a source of contamination to the wetland. In addition, contaminated ground water discharging into the wetland through seeps is also acting as a continuing source of wetland contamination. Contamination in the wetland migrates into Haystack Brook during significant precipitation and associated flooding events.

Additional sampling of the wetland sediment will be conducted prior to finalizing the remedial design in order to better delineate the horizontal and vertical extent of contamination.

Ground Water

Shallow ground water has been impacted by the ZRC site. Overall, the contamination is characterized by chromium and nickel. A confining layer exists between the shallow and deep aquifers, and ground water in the deep aquifer has not been impacted by the site. Nearby residential wells were sampled and were not found to be impacted by the site.

Chromium was detected at levels exceeding the National Primary Drinking Water Standards (100 parts per billion, or ppb) and nickel was detected at concentrations exceeding New Jersey ground water quality standards (100 ppb) in samples collected from shallow monitoring wells located northeast and immediately downgradient of the site building. The highest concentrations of chromium and nickel detected in the shallow aquifer were 648 and 151 ppb, respectively. Nickel was detected at concentrations that exceed criteria in samples collected about 120 feet southeast and downgradient of the site on private property.

The extent of the contaminants in the shallow aquifer is limited. Based on water level measurements and observations of seeps, shallow contaminated ground water discharges either through wetland seeps or to Haystack Brook, which is about 100 feet east of the site building.

The deep aquifer is overlain by approximately 30 feet of silt-clay acting as a barrier to the downward migration of contamination. In addition, the vertical gradient between the shallow and deep aquifers is neutral on-site and upwards downgradient of the site, which is consistent with the ground water results from the lower aquifer that show no site impacts.

Overall, the nature and extent of ground water contamination has been characterized. Shallow ground water has been contaminated through leaching and infiltration of contamination in subsurface soil. Because significant contamination remains in subsurface soil, continued contaminant migration to ground water will occur.

Wetland Seeps

Sampling of seeps in the wetland area also provide evidence that ground water has been impacted by the site. Contaminated ground water discharges through seeps and provides a continuing source of contamination to the wetland. The contamination detected in the seeps is characterized by chromium, copper, and nickel, at concentrations as high as 2,480, 2,970, and 1,300 ppb, respectively. Five other metals were also detected at concentrations that exceed NJDEP ground water standards.

Haystack Brook and Pond Sediment

Sediment in Haystack Brook and the adjacent pond have been impacted by the ZRC site. Eight metals were detected in sediment samples collected during three sampling rounds at concentration that exceed the NJDEP sediment lowest effects level (LEL) screening criteria. PAHs and pesticides were also detected in sediment samples at concentrations that exceed screening criteria, but are not believed to be site related, as they are typically associated with urban areas. Chromium, copper, and nickel were detected most often and at the highest magnitudes of all contaminants.

Sediment impacts to Haystack Brook stretch from the ZRC site to at least the furthest downstream sampling location, 2,200 feet from the site. Maximum concentrations of chromium, copper, and nickel were, respectively, 130, 458, and 944 ppm.

A significant increase in contaminant concentrations occurred between the first and second round of samples collected in the portion of the Brook adjacent to the site. This increase in second round samples concentrations probably resulted from significant precipitation and subsequent flooding of Haystack Brook during the month preceeding the second round of sampling. Contaminated sediment exists in the wetland adjacent to these locations and was probably flushed into Haystack Brook during the flooding. It is expected that future precipitation events and subsequent flooding will continue to flush contaminated material from the wetland into Haystack Brook.

In the adjacent pond, copper and nickel exceed screening criteria, with maximum concentrations of 123 and 78 ppm, respectively. Contaminated sediment in the pond probably results from contaminated surface water runoff from the ZRC site. Contaminated surface soil from the ZRC site will probably continue to migrate downhill to the pond.

Haystack Brook and Pond Surface Water

Surface water in Haystack Brook and the adjacent pond is contaminated with site-related metals. Copper, five other inorganics, and benzene were detected at concentrations that exceed the NJDEP Surface Water Quality Criteria and/or Federal Ambient Water Quality Criteria. However, only copper can be conclusively attributed to the site. In addition, cyanide in surface water may be attributable to the site.

Copper exceeds criteria in the majority of surface water samples, with a maximum detected concentration of 8.9 ppb. Copper was also detected consistently during two rounds of sampling, whereas most other contaminants were detected during only one sampling round. This indicates a consistent release of copper to Haystack Brook. Ground water contaminated with copper discharging to Haystack Brook could be the cause of contamination within Haystack Brook. Contamination in the adjacent pond probably migrated with surface water runoff.

It is possible that cyanide can also be attributed to the site. Cyanide was detected at concentrations that exceed screening criteria in just over half the samples, at a maximum concentration of 30 ppb . Although cyanide has been historically linked to the site and was consistently detected in both sampling rounds, the mechanism for its release to surface water is not clear. It was not detected in ground water at concentrations above New Jersey Ground Water Quality Criteria. The question of cyanide in surface water is further confused by the fact that the maximum concentration was detected in a sample collected immediately upstream of the site. Regardless, the remedial action should address this issue and surface water monitoring will be conducted during the remedial action to verify that it does.

Building Materials

The building at the site is contaminated. Wipe and chip samples analyzed for total metals indicated a wide variety of contamination. Samples analyzed for Resource Conservation and Recovery Act (RCRA) metals following Toxicity Characteristic Leaching procedure (TCLP) extraction indicated that, for disposal purposes, building materials would not be considered hazardous waste. Overall, the building itself represents the greatest threat to human health because of the physical dangers it poses. The building is dilapidated and in very poor condition, making it a physical hazard. Because of its status as an abandoned building on a somewhat rural site, the building is an inviting target for trespassers. Soil contamination also exists under the building and if the soils are to be addressed, the building would need to be demolished.

SCOPE AND ROLE OF THE ACTION

This action, referred to as Operable Unit 1 (OU1), is intended to be the final action for the site. This Proposed

Plan summarizes the remedial alternatives detailed in the Feasibility Study, and discusses the preferred alternatives for addressing contaminated soil, sediment, and ground water at the ZRC site.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted baseline risk assessments to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by exposure to hazardous substances from a site in the absence of any actions or controls to mitigate these exposures under current and future land uses.

Currently, the ZRC site is unoccupied and surrounded by a fence. It is zoned Agricultural Real Estate, which leaves open the possibility for either residential or industrial development, and the ground water below the site is designated as a potable water supply. A large portion of the site also consists of wetland area through which runs the Haystack Brook, so potential environmental risks are a significant concern. Both a Baseline Human Health Risk Assessment (HHRA) and a full Baseline Ecological Risk Assessment (BERA) were completed for this site.

WHAT ARE THE CONTAMINANTS OF CONCERN?

For human health risk, silver in the surface soil, copper in the wetland sediment and hexavalent chromium, chloroform, and iron in the ground water are considered the contaminants of concern at this site. These chemicals are associated with non-cancer health effects to the liver, gastrointestinal tract, and skin.

For ecological risk, elevated concentrations of several inorganic contaminants of concern in sediment, particularly chromium, copper, nickel, cadmium, and silver, pose serious risks to sediment-dwelling ecological receptors. Very high concentrations of several inorganic contaminants, including chromium, pose significant risks to soil-dwelling receptors. Moderately high concentrations of some inorganic and organic contaminants, including cyanide and total chlordane, in Haystack Brook surface water, pose significant risks to aquatic receptors.

Human Health Risks

The most likely current receptors are trespassers who may visit the site. Potential future receptors on the site include residents, evaluated as both adults and children (0 to 6 years), site workers, and construction workers. Exposure routes for future residents are ingestion of and dermal contact with surface soil, ground water, and sediment, as well as inhalation of fugitive dust and of ground water vapors while bathing or showering. Future site workers might be exposed to contaminants through ingestion of and dermal contact with surface soil and contaminant deposition inside the on-site building, ingestion of ground water, and inhalation of fugitive dust. Future construction workers could be exposed to surface and subsurface contamination during construction activities.

The quantification of exposure is based on an estimate of chronic daily intake, the average amount of the chemical contaminant entering the receptor's body per day. The chronic daily intake is combined with information about each contaminant of concern's toxicity to calculate the human health risk posed.

The cancer risks for exposure to contaminants at the ZRC were all within or below the USEPA's acceptable cancer risk range for 1×10^{-4} to 1×10^{-6} (one in 10,000 to one in 1,000,000). However, non-cancer health hazards for future on-site residents (both adults and children) and workers exceeded the USEPA's Hazard Index (HI) of 1. The exceedence of an HI of 1 indicates an increased level of concern.

The non-cancer HI is 24 for the residential child and 7 for the residential adult, indicating that non-cancer health effects may occur from the combined exposures to soil, ground water, and sediment in the wetland. The total HI for the site worker is 2, which slightly exceeds the threshold of 1 for non-cancer effects. Although exposure to surface soil and wetland sediment contributes significantly to the non-cancer health hazard potential for these receptors, contaminants in the ground water pose the greatest potential risk if the shallow ground water were used for potable purposes.

Ecological Risks

A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario: *Problem Formulation* - a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. *Exposure Assessment* - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment* - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* - measurement or estimation of both current and future adverse effects.

Prior to completing a BERA, a screening-level ecological risk assessment (SLERA) is prepared to determine if a BERA is necessary. At the ZRC site, the SLERA documented that contaminants of potential ecological concern are present in each of the media assessed; chemicals found in site surface soils, sediments, and surface water indicate the potential for adverse risks to aquatic and terrestrial receptors. Therefore, a BERA was completed.

As part of the BERA, threatened and endangered species surveys for the bog turtle and swamp pink were performed. Neither bog turtles nor swamp pink were found in the study area. However, potential bog turtle habitat was found in the wetland area next to the site.

BERA activities also included Haystack Brook sediment sampling, pond sediment sampling, benthic macroinvertebrate community characterization in Haystack Brook, an avian survey, biota sampling (small mammal and vegetation sampling), and toxicity test sampling.

Ecological risks are quantitatively assessed using a Hazard Quotient (HQ). An HQ greater than 1 indicates a moderate risk to ecological receptors. An HQ greater than 10 indicates a high risk to ecological receptors.

As with the HHRA, metals are the primary contaminants of concern in the BERA. An HQ above 10 was found over much of the wetland area adjacent to the soil portion of the site and over some of the surface soil. The maximum HQ found in the wetland area for chromium, copper, and nickel was 323, 261, and 179, respectively, and the average HQ for these contaminants over the wetland area was 54, 53, and 13. An HQ of greater than 1 was found over most of the entire wetland study area.

REMEDIAL ACTION OBJECTIVES

The overall remediation goal for the site is to protect human health and the environment. Several remedial action objectives (RAOs) have been identified to mitigate the potential risks associated with the site.

Soil

The following RAOs for contaminated soil address the human health and ecological concerns for this media at the site:

- Prevent or minimize potential future exposures of humans to contaminated surface soil;
- Prevent or minimize adverse ecological impacts from contaminated surface soil; and
- Prevent or minimize contamination in soil as a source of ground water, surface water, and sediment contamination.

Sediment

The following RAOs for contaminated sediment, both in the wetland area and a small portion of Haystack Brook, address the human health and ecological concerns for this media at the site:

- Prevent or minimize potential future human exposures to contaminated wetland sediment;
- Prevent or minimize adverse ecological impacts from contaminated wetland sediments;
- Preserve, to the extent possible, the approximately one acre area adjacent to the site that is a potentially suitable habitat for the bog turtles; and
- Prevent or minimize contamination in wetland sediments as a source of Haystack Brook sediment and surface water contamination.

Ground Water

The following RAOs for contaminated ground water address the human health and ecological concerns for this media at the site:

- Restore contaminated ground water for beneficial use;
- Prevent future human exposure including ingestion and dermal contact with contaminated ground water; and
- Prevent or minimize contaminated ground water from discharging into the wetland and Haystack Brook.

There are no RAOs for the remaining media. There are no RAOs for the seeps because the source of the seeps is the ground water. The seeps will be monitored to assure that the ground water remedy is effective in reducing the seep contamination. Likewise, for the Haystack Brook surface water, remediation of the sources, including runoff from the wetland sediment and ground water infiltration, will effectively reduce elevated contaminant levels. Once again, this will be verified by monitoring. There are no RAOs for the pond or the building because none of the health-based or ecologically-based benchmarks were exceeded.

Preliminary remediation goals (PRGs) were developed for the site contaminants based on regulatory requirements, risk-based cleanup levels, or background values. Cleanup of the site contaminants to concentrations at or below the PRGs will reduce the non-cancer hazards to humans to below an HI of 1. Surface soil PRGs are based on an ecological HQ of 1, while subsurface soil PRGs are based on site-specific impact to ground water concentrations. Sediment PRGs are based on the findings of the baseline ecological risk assessment, and were chosen in order to balance the dual goals of reducing the risk to ecological receptors with minimizing the impact to the wetland. Additional wetland sediment sampling will be conducted prior to conducting the remedial action, and more conservative (i.e., lower) PRGs may be used over all or part of the wetland if appropriate. In all cases, the PRGs which are based on ecological risk are significantly lower than what they would be if based on human health risk.

The PRGs for each media, which were developed in the FS, follow.

Surface Soils

Chromium	32 ppm
Copper	50 ppm
Nickel	20 ppm
Silver	2 ppm

Subsurface Soils
(in absence of active ground water treatment)

Chromium	500 ppm
Copper	500 ppm
Nickel	20 ppm
Silver	20 ppm

Sediment (both wetland and Brook)

Chromium	430 ppm
Copper	320 ppm
Nickel	230 ppm
Silver	20 ppm

Ground Water

Chromium	100 ppb
Nickel	100 ppb

SUMMARY OF REMEDIAL ALTERNATIVES

NO ACTION ALTERNATIVES

Alternative S1/SD1/GW1: NO ACTION
Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Time frame: None

Regulations governing the Superfund program require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action at the site to presvent exposure to contaminated soil, sediment, or ground water. Because contamination would be left in place under these alternatives, a review of the remedy every five years would

SUMMARY OF REMEDIAL ALTERNATIVES
ZSCHIEGNER REFINING COMPANY SITE

Medium	RI/FS Designation	Description
SOIL	S1	No action
	S2	Excavation of surface soil; off-site disposal; backfill with clean fill
	S3	Excavation of surface soil; ex situ treatment using solidification/stabilization; backfill with treated soil
	S4	Excavation of surface and subsurface soil; off-site disposal; backfill with clean fill
SEDIMENT	SD1	No action
	SD2	Excavation of sediment; off-site disposal; backfill with clean fill and wetland restoration
GROUND WATER	GW1	No action
	GW2	Pump and treat; discharge to Haystack Brook; long-term monitoring
	GW3	Permeable reactive barrier; long-term monitoring
	GW4	Short-term monitoring with institutional controls; contingent active remedy

be required.

SOIL ALTERNATIVES

Alternative S2: Excavation of Surface Soil, Off-Site Disposal, and Backfill with Clean Fill

Estimated Capital Cost: $1,600,000
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $1,600,000
Estimated Construction Time frame: 6 months

Approximately 1,750 cubic yards (CY) of surface soil exceeding PRGs would be excavated, to a depth of 2 feet below ground surface (bgs). Post-excavation sampling would be conducted to ensure that PRGs are met. The excavated soil would be transported off-site and disposed of at an approved RCRA hazardous or non-hazardous facility, as appropriate. The excavated area would be backfilled with common fill, covered with topsoil and restored to its original grade, and seeded.

This alternative would eliminate the potential for exposure to surface soils, but would leave contaminants in the subsurface at levels that would likely continue to impact ground water. Therefore, a five-year review of the remedy would be required and institutional controls may be needed.

Alternative S3: Excavation of Surface Soil, Ex Situ Treatment, and Backfill of Treated Soil

Estimated Capital Cost: $1,500,000
Estimated Annual O & M Cost: $0
Estimated Present Worth Cost: $1,500,000
Estimated Construction Time frame: 6 months

As with Alternative S2, this alternative would include excavation of approximately 1,750 CY of surface soils exceeding PRGs, to a depth of 2 feet bgs. The alternative would include ex situ solidification/ stabilization of the excavated soil, and backfilling of the treated soil. The remedy could also include disposal of some treated soils if necessary due to volume increases. Post-remediation monitoring to verify achievement of the RAOs is also included.

Chemical stabilization will be used to treat the soil. During chemical stabilization, a substance is added to the soil which creates a chemical bond with the contaminants to create a non-hazardous final waste form and immobilizes contaminants by reducing the solubility of the waste. A pre-design study would need to be conducted to determine the best process to use in order to achieve this result.

As with Alternative S2, this alternative would eliminate the potential for exposure to surface soils, but would leave contaminants in the subsurface at levels that would likely continue to impact ground water. Therefore, a five-year review of the remedy would be required and institutional controls may be needed.

Alternative S4: Excavation of Surface and Subsurface Soil, Off-Site Disposal, and Backfill with Clean Fill

Estimated Capital Cost: $2,900,000
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $2,900,000
Estimated Construction Time frame: 9 months

As with Alternatives S2 and S3, this alternative would include the excavation of approximately 1,750 CY of surface soil exceeding PRGs, to a depth of 2 feet bgs. This alternative would also include the excavation of an additional 1,240 CY of subsurface soil with concentrations of contaminants above the impact to ground water concentrations calculated for this site. Contaminated soil would be disposed of at an approved off-site facility. The excavated areas would be sampled prior to backfill to verify achievement of the PRGs, and then backfilled with clean fill. Finally, the affected areas would be graded and seeded.

Unlike the previous soil alternatives, this option would require the demolition of the on-site building, since soil beneath the building is contaminated at levels above the subsurface PRGs.

Also unlike the previous soil alternatives, this alternative would remove contamination from both surface and subsurface soils. As such, an active ground water remedy may not be required.

SEDIMENT ALTERNATIVES

Alternative SD2: Excavation, Off-Site Disposal, and Backfill with Clean Fill

Estimated Capital Cost: $3,400,000
Estimated Annual O&M Cost: $28,000
Estimated Present Worth Cost: $3,700,000
Estimated Construction Time frame: 12 months

This alternative includes the excavation and off-site disposal of at least 4,500 CY of contaminated wetland sediment, backfill of the affected area, and restoration of the wetland. If the volume of contaminated sediment to be excavated increases, based on additional sampling to be conducted during the remedial design, the cost of this alternative will increase.

Because the ground water table is at or near the surface throughout the affected portion of the wetland, excavation limits will need to be determined prior to excavation. The wetland will be divided into small sections, and each small section will be cleared, excavated, and backfilled one at a time. Water from the excavation will be pumped out and treated prior to discharge to aid the excavation.

A staging area will also need to be constructed to dewater the excavated sediments, as necessary, prior to transportation to an off-site disposal facility.

One of the RAOs is to minimize impact to the wetland area. As such, some larger vegetation may be retained, if possible. Otherwise, all affected areas of the wetland will be restored as nearly as possible to their original condition, and monitored for at least 5 years.

GROUND WATER ALTERNATIVES

Alternative GW2: Ground Water Extraction, Treatment, On-Site Surface Water Discharge, Institutional Controls, and Long-Term Monitoring

Estimated Capital Cost: $780,000
Estimated Annual O&M Cost: $180,000
Estimated Present Worth Cost: $3,000,000
Estimated Construction Time frame: 12 months
Estimated Time to Achieve RAOs: 30 years

This alternative includes the installation of extraction wells just upgradient of the wetland, treatment of extracted ground water, and discharge of the treated water to Haystack Brook. The number of extraction wells would be determined in design, but for evaluation purposes, it is assumed that four wells would be needed. Samples of the treated water would be taken periodically to ensure compliance with the New Jersey Pollution Discharge Elimination System requirements.

The objectives of this alternative are to prevent contaminated ground water from migrating off-site by hydraulically containing the contaminant plume, and to accelerate the cleanup of contaminated ground water in the impacted area. Treatment may involve using liquid-phase chemical adsorption and filtration, but other approaches will be evaluated during the remedial design.

Institutional controls, in the form of well drilling permit restrictions, would be implemented to prevent exposure to contaminated ground water during remediation.

Since the source of ground water contamination, the subsurface soil, would remain if this option is chosen, and the rate of migration of heavy metals is expected to be slow, a 30-year remediation period is assumed at this point. Long-term ground and surface water monitoring would be required to monitor the effectiveness of the remedy. Adjustments to the remedy may be made if monitoring indicates the need.

Alternative GW3: In Situ Permeable Reactive Barrier, Institutional Controls, and Long-Term Monitoring

Estimated Capital Cost: $714,000
Estimated Annual O&M Cost: $130,000
Estimated Present Worth Cost: $2,300,000
Estimated Construction Time frame: 6 months
Estimated Time to Achieve RAOs: 30 years

As part of this alternative, a permeable reactive barrier would be installed at the upgradient margin on the wetland. The permeable barrier would utilize a medium capable of removing metals from ground water via precipitation.

As with Alternative GW2, institutional controls, in the form of well drilling permit restrictions, would be implemented to prevent exposure to contaminated ground water during remediation. Long-term ground water and surface water monitoring would be required to track the effectiveness of the remedy. A 30-year remediation period is assumed for comparison of alternatives.

Alternative GW4: Short-Term Monitoring and Institutional Controls with Contingent Active Remedy

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $50,000
Estimated Present Worth Cost: $130,000
Estimated Construction Time frame: None
Estimated Time to Achieve RAOs: 3or more years

This remedy option does not involve active treatment of the ground water. Instead, it is based on the assumption that the removal of the source of ground water contamination, contaminated subsurface soil, would effectively reduce contaminant levels in the ground water over time. Therefore, this alternative includes monitoring of ground water for a period of 3 years after removal of subsurface soil contamination. The existing monitoring well network, installed for use during the remedial

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

investigation, would be utilized and, if necessary, additional wells would be installed.

Contaminant trends would be evaluated at the end of the monitoring period. If the data indicate that contaminant concentrations are being sufficiently reduced as a result of the source removal, no further action, other than continued ground and surface water monitoring for a period to be decided, would be required. If, instead, the concentration trends suggest that ground water will remain contaminated above criteria, an active treatment option, such as a permeable reactive barrier as described in Alternative GW3 above, would be implemented.
As with Alternatives GW2 and GW3, institutional controls, in the form of well drilling permit restrictions, would be implemented to prevent exposure to contaminated ground water. The costs and time frame listed above are based on the assumption that an active remedy will not be necessary and that no additional monitoring wells will need to be installed.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select an alternative. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. The "Detailed Analysis of Alternatives" can be found in the FS.

1. **Overall Protection of Human Health and the Environment**

All of the alternatives except the "no action" alternatives (S1, SD1, and GW1) would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through the removal or treatment of contaminated material and/or institutional controls.

Alternatives S2, S3, and S4 are protective of human health and the environment because they eliminate current and future exposure to contaminated soil. Alternative S2 is more protective than S3 since contaminated soils would be disposed of off-site, and Alternative S4 is the most protective since it prevents exposure to surface contamination and potential impacts to ground water.

Alternative SD2 is protective of human health and the environment since it eliminates contaminated sediments, but it would destroy wetland acreage during excavation activities. There is uncertainty regarding wetland restoration and it may be difficult to completely restore the wetlands to their original condition.

Alternatives GW2, GW3, and GW4 would all provide protection of human health and the environment. Alternative GW2 would accelerate contaminant cleanup through active pumping. Alternative GW3 relies on natural ground water flow to move the contaminants through the treatment barrier. Alternative GW4 is protective because it includes monitoring and the contingency to implement active treatment if source removal alone is not sufficient to alleviate the problem.

Because the "no action" alternatives are not protective of human health and the environment, they were eliminated from consideration under the remaining eight criteria.

2. **Compliance with ARARs**

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements (ARARs) of federal and state law or provide grounds for invoking a waiver of these requirements. These include chemical-specific, location-specific, and action-specific ARARs. There are no chemical-specific ARARs for the contaminated soils. Alternatives S2 and S3 would meet the site-specific PRGs for surface soil but not for subsurface soil. Alternative S4 would meet the site-specific PRGs for both surface and subsurface soil.

There are no chemical-specific ARARs for contaminated sediment. Alternative SD2 would attain site-specific, risk-based PRGs and would meet all location- and action-specific ARARs.

Alternatives GW2, GW3, and GW4 would comply with the appropriate ARARs from federal and state laws.

3. **Long-term Effectiveness and Permanence**

Alternative S4 is the most effective in the long-term as contaminated surface and subsurface soil would be removed from the site and long-term monitoring of any media would likely not be required under this option. Alternatives S2 and S3 would leave contaminated subsurface soils at the site, which could continue to leach into the ground water. Contaminated ground water could then continue to impact the wetland sediment and Haystack Brook. Alternatives S2 and S4 are more permanent and effective than S3 since each removes contaminants off-site.

Alternative SD2 would be effective in the long-term since contaminated sediment would be removed.

Alternatives GW2, GW3, and GW4 would all be effective in the long-term. Alternative GW2 may achieve attainment of cleanup goals faster than Alternative GW3 since active pumping would be involved. Alternative GW4 would be effective and permanent if paired with

Alternative S4 since the source of contamination would be removed.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment**

Alternatives S2 and S4 would not reduce toxicity, volume, or mobility through treatment. Each would reduce mobility of contaminants in surface soils through removal of contaminated soil and disposal at an off-site facility. Alternative S3 would reduce mobility of surface soil through stabilization, but could actually increase the volume of contaminated soil. Neither S2 or S3 would reduce the mobility of contaminants in subsurface soils.

Alternative SD2 would not reduce toxicity, mobility, or volume through treatment, but would reduce mobility through off-site disposal.

Alternatives GW2 and GW3 would reduce the toxicity, mobility, and volume of contaminants through treatment. Alternative GW4 would not reduce any of these through treatment, unless a contingent active remedy were triggered.

5. **Short-term Effectiveness**

Alternatives S2, S3, and S4 would all present short-term risk because of the potential for exposure to contaminated soil during excavation. Alternatives S2 and S4 would achieve a lower degree of short-term effectiveness than Alternative S3 because both would require off-site transportation to disposal facilities, increasing the potential for a release to occur during the shipment, as well as potential noise and traffic issues. Air monitoring, engineering controls, and the appropriate use of personal protective equipment for workers would be an effective means to protect the community and workers.

As with Alternatives S2 and S4, SD2 would achieve a low degree of short-term effectiveness because it would require off-site transportation to disposal facilities, increasing the potential for a release to occur during the shipment, as well as potential noise and traffic issues. Air monitoring, engineering controls, and the appropriate use of personal protective equipment for workers would be an effective means to protect the community and workers.

Alternatives GW2, GW3, and GW4 would all be effective in the short term. Alternative GW3 would be slightly less effective than GW2 due to the construction requirements of installing a permeable reactive barrier. Alternative GW4 would be the most effective since no construction would be required, unless a contingent active remedy were triggered. Again, the effectiveness of GW4 is dependent on removal or the source contamination.

6. **Implementability**

Alternative S2 would be easiest to implement since there are only excavation and disposal facility issues to resolve. Alternative S3 would be easy to implement technically, but could be administratively difficult to implement because post-remediation monitoring would be needed. Alternative S4 could be more difficult to implement technically than S2, because of the greater depth of excavation, and administratively, because of the need to demolish the building.

Alternative SD2 would be somewhat difficult to implement. Supplies and services would be readily obtainable. The density of vegetation and the moisture content of the sediments in the area would pose difficulties to construction efforts. Restoration of rare wetland habitats would also be problematic. Federal and state permit requirements would need to be satisfied for construction within the wetland area. Significant coordination effort would be required between the agencies.

Alternatives GW2, GW3, and GW4 are technically implementable. Alternative GW2 would be implemented using conventional construction methods and equipment. The technical feasibility of pumping and treatment has been established at other sites. No technical difficulties are anticipated for installation of the ground water extraction and treatment system. Services and materials for the adsorption media are readily available but only from one vendor. For Alternative GW3, some choices for reactive media would require the reactive barrier to be replenished every two years. Materials and supplies for doing this would be readily obtainable, though there may be concerns about using a proprietary technology from a single vendor. A treatability study may be required to demonstrate effectiveness. Alternative GW4 would be easiest to implement since no work other than monitoring may be required. No problems are forecasted for the implementation, monitoring, and enforcement of the institutional controls.

7. **Cost**

The estimated present worth cost of Alternative S2 is $1.6 million, Alternative S3 is $1.5 million, and Alternative S4 is $2.9 million. The estimated present worth cost of Alternative SD2 is $3.7 million. The estimated present worth cost of Alternative GW2 is $3.0 million, Alternative GW3 is $2.3 million, and the estimated present worth cost of Alternative GW 4 is $130,000, assuming an active ground water remedy is not required.

Alternatives S2 and S3 would require the implementation of either GW2 or GW3. Even though Alternative S4 costs significantly more than S2 or S3, it would be implemented along with GW4, thus balancing the cost differential.

8. **State/Support Agency Acceptance**

The State of New Jersey is still evaluating EPA's preferred alternative in this Proposed Plan.

9. **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision, the document that formalizes the selection of the remedy, for the site.

SUMMARY OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for cleaning up soils, sediment, and ground water at the ZRC site is a combination of Alternatives S4 (excavation of surface and subsurface soil/off-site disposal), SD2 (excavation/off-site disposal of contaminated sediment), and GW4 (short-term monitoring with institutional controls/contingent active remedy). The Preferred Alternative includes the excavation, transportation and disposal, of an estimated 2,990 cubic yards of soil and at least 4,500 cubic yards of sediment, with monitoring of ground water to determine the need for active treatment.

The Preferred Alternative was selected over other alternatives because it is expected to achieve substantial and long-term risk reduction through off-site disposal, and is expected to allow the property to be used for the reasonably-anticipated future land uses, which is residential or agricultural. It will achieve the key RAOs of preventing or minimizing potential future exposures of humans to contaminated surface soil, sediment, and ground water; preventing or minimizing adverse ecological impacts from contaminated surface soil and sediment; preventing or minimizing contamination in soil as a source of ground water, surface water, and sediment contamination, contamination in wetland sediments as a source of Haystack Brook sediment and surface water contamination, and contamination in ground water as a source of wetland and Haystack Brook contamination; minimizing the impact to the wetland; and restoring the contaminated ground water for beneficial use.

The Preferred Alternative reduces the risk within a reasonable time frame, at comparable cost, and provides for long-term reliability of the remedy. Based on the information available at this time, EPA believes the Preferred Alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

EPA and NJDEP provide information regarding the cleanup of the ZRC site to the public through public meetings, the Administrative Record file for the site, and announcements published in the Asbury Park Press. EPA and the State encourage the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there. The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan. EPA Region 2 has designated an Ombudsman as a point-of-contact for community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number that the public can call to request information, express their concerns or register complaints about Superfund.

For further information on the ZRC site, please contact:

Stephanie Vaughn	Natalie Loney
Remedial Project Manager	Community Relations Coordinator

U.S. EPA
290 Broadway, 19th Floor.
New York, New York 10007-1866

The ombudsman for EPA's Region 2 office is:

George H. Zachos
Ombudsman
Toll-free (888) 283-7626
(732) 321-6621